



1999–2000 CATS ASSESSMENT

Open-Response Item Scoring Worksheet

Grade 7 – Science

The **academic expectation** addressed by “Dinosaur Fossil” is

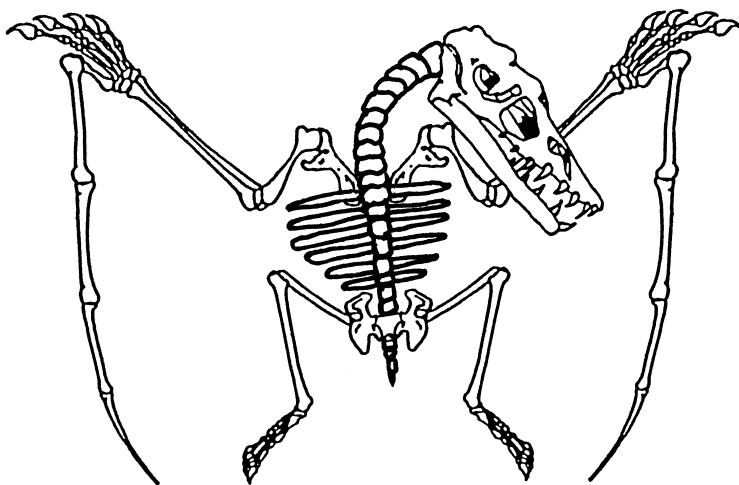
- 2.4 Students use the concept of scale and scientific models to explain the organization and functioning of living and non-living things and characteristics that might be observed.

The **core content** addressed by this item includes:

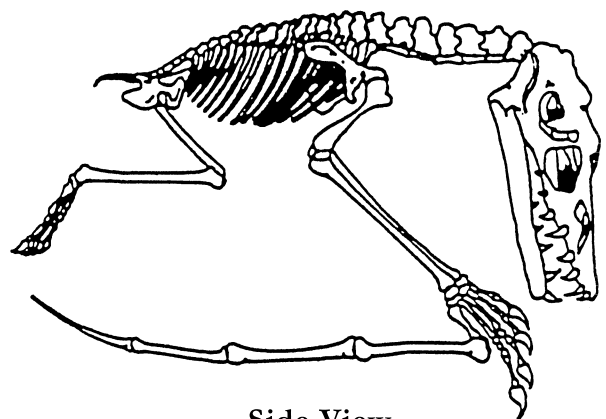
- SC-M-3.4.1 Biological change over time accounts for the diversity of species developed through gradual processes over many generations. Biological adaptations include changes in structures, behaviors, or physiology that enhance survival and reproductive success in a particular environment.
- SC-M-3.1.1 Living systems at all levels of organization demonstrate the complementary nature of structure and function. Important levels of organization for structure and function include cells, tissues, organs, organ systems, organisms (e.g., bacteria, protists, fungi, plants, animals), and ecosystems.

Dinosaur Fossil

Features such as the bone size or structure of an animal’s skeleton often help scientists determine the animal’s characteristics, which include how it moves, what it eats, or even the predator/prey relationships of the animal. In 1826, scientists in Germany uncovered the fossilized bones of the dinosaur illustrated below.



Front View



Side View

This dinosaur was about twice the size of this drawing.

- List three features of the skeleton of this dinosaur.
- Explain how each of the features you listed relates to a characteristic that helped the dinosaur live.



SCORING GUIDE

Grade 7 Science

Score	Description
4	The response is complete and shows an in-depth understanding of the relationship between structure and function. A clear and accurate identification of three features of the skeleton and a thorough explanation of how these features relate to the dinosaur's characteristics and survival are included.
3	The response shows a good understanding of the relationship between structure and function. An accurate identification of at least two features of the skeleton and a correct explanation of how these features relate to the dinosaur's characteristics and survival are included. The response may lack detail or contain minor errors and omissions.
2	The response shows a limited understanding of the relationship between structure and function. An identification of at least one feature of the skeleton and a plausible explanation of how this feature relates to the dinosaur's characteristics and/or survival is included. The response may contain misconceptions, errors, or omissions.
1	The response is incomplete and shows a minimal understanding of the relationship between structure and function. Features of the skeleton are identified, but any attempt to explain the relationship between the features and the characteristics and/or survival of the dinosaur contains major errors, misconceptions, and/or omissions.
0	Response is totally incorrect or irrelevant.
Blank	No response.

Possible Student Response:

The skeleton shows sharp teeth and claws, and a very long bony finger. The sharp teeth and claws were useful for catching prey and eating it. The long finger was probably part of a wing so it could fly. This also helped it search for and catch food. All these features helped the dinosaur survive.

Science Behind the Question:

The skeleton provides the following information:

- The teeth indicate it ate meat.
- The claws indicate it hung somewhere like a bat.
- The long finger indicates that it probably had a wing-like structure and flew or glided.
- The small hind legs indicate that it did not spend much time on the ground.



ANNOTATED STUDENT RESPONSE

Grade 7 Science

Sample 4-Point Response of Student Work

Student Response

Three of the features that I think are distinctly shown are large teeth, bones that come from the claws that obviously were wings, and large, sharp claws. These characteristics were a big help to the dinosaur to live.

The large teeth probably helped the dinosaur rip things up and chew their food. The teeth would also be useful when the animal was defending itself.

The wings were useful because it could help the dinosaur get away from a predator and pursue after their prey. The wings could also be used as a form of protection when being attacked.

The claws could have been used to catch their prey and scoop it up while in flight. The claws could have been used for tearing away pieces of meat from its prey.

The teeth, the wings, and the claws are all very important parts of this animal. Without them, the dinosaur probably wouldn't have been able to live.

← Student clearly and accurately identifies three features of the skeleton (i.e., large teeth, bones from the claws that formed wings, and large, sharp claws).

← Student thoroughly explains how having large teeth relates to the dinosaur's characteristics and survival (e.g., the animal's large teeth helped it to "rip things up" and to defend itself).

← Student thoroughly explains how having wings relates to the dinosaur's characteristics and survival (e.g., the animal used wings to fly when pursuing prey and "as a form of protection when being attacked").

← Student thoroughly explains how having claws relates to the dinosaur's characteristics and survival (i.e., the animal used claws to "scoop" prey up while in flight and for "tearing away pieces of meat from its prey").

Overall, the student shows a strong understanding of how observation of the structure and scale of an animal's skeleton can provide information about characteristics of the animal. The student clearly and accurately identifies three features of a dinosaur skeleton shown in a diagram and thoroughly explains how each feature relates to the animal's characteristics and survival.



ANNOTATED STUDENT RESPONSE

Grade 7 Science

Sample 4-Point Response of Student Work

Student Response

One of the features I can tell by looking at this skeleton is that it is a flying dinosaur. I can tell by the bones that hang down from his hands. This characteristic helped the dinosaur by allowing it to get away from its predators easier since it was only a little dinosaur. It could have also helped it get its food if it ate fish so it wouldn't have to get in the water.

I can tell that this animal is a meat eater. I can tell by its sharp teeth. This helped it to chew its food better of course and protect itself better.

Another feature is its sharp claws I can see. This feature probably helped this animal to eat as to tearing its prey to make it a little easier to eat. This feature can also help this animal by carrying its prey.

← Student clearly and accurately identifies one feature of the skeleton (i.e., “bones that hang down from his hands”) and thoroughly explains how the feature relates to the dinosaur’s characteristics and survival (i.e., the animal is a flying dinosaur that used wings to escape from predators and to catch fish).

← Student clearly and accurately identifies a second feature of the skeleton (i.e., sharp teeth) and thoroughly explains how the feature relates to the dinosaur’s characteristics and survival (i.e., the animal was a meat-eater that used its sharp teeth to chew its food and to protect itself).

← Student clearly and accurately identifies a third feature of the skeleton (i.e., sharp claws) and thoroughly explains how the feature relates to the dinosaur’s characteristics and survival (i.e., the animal used claws for “tearing its prey” and “carrying its prey”).

Overall, the student shows a strong understanding of how observation of the structure and scale of an animal’s skeleton can provide information about characteristics of the animal. The student clearly and accurately identifies three features of a dinosaur skeleton shown in a diagram and thoroughly explains how each feature relates to the animal’s characteristics and survival.



ANNOTATED STUDENT RESPONSE

Grade 7 Science

Sample 3-Point Response of Student Work

Student Response

The skeleton shown in this picture has a unique bone structure. There are three features of this skeleton, that, to me just pop out at you. Here are the three main features I saw. The first one is, it has sharp teeth. This means it was probably a meat, and they could have been used as protection against other dinosaurs. The next feature is it has a long bone extending from its hand and ends a few inches past its feet. This means it could have had wings. That would help them stay alive. This dinosaur also had claws. The claws could have been used to tear up its food, or as protection. Those, to me, are the three main features of this dinosaur.

← Student accurately identifies one feature of the skeleton (i.e., sharp teeth) and explains how this feature relates to the dinosaur's characteristics and survival (i.e., "it was probably a meat [eater]," and the teeth "could have been used as protection against other dinosaurs").

← Student accurately identifies a second feature of the skeleton (i.e., "a long bone extending from its hand") and provides a limited explanation of how this feature relates to the dinosaur's characteristics and survival (i.e., "it could have had wings" which "would help them stay alive").

← Student accurately identifies a third feature of the skeleton (i.e., claws) and explains how this feature relates to the dinosaur's characteristics and survival (i.e., "The claws could have been used to tear up its food, or as protection").

Overall, the student shows a good understanding of how observation of the structure and scale of an animal's skeleton can provide information about characteristics of the animal. The student accurately identifies three features of a dinosaur skeleton shown in a diagram; correctly explains how two of the features relate to the animal's characteristics and survival; and provides a limited explanation of how the third feature relates to the animal's characteristics and survival.



ANNOTATED STUDENT RESPONSE

Grade 7 Science

Sample 2-Point Response of Student Work

Student Response

A. It was a cornivor and it could fly Also it had a long neck.

B. It was a cornivor so it ate meat and flying helped it catch it's food and also a long neck helped to catch food.

← Student correctly identifies one feature of the skeleton (i.e., a long neck). Student hypothesizes that the dinosaur was a carnivore and could fly, but does not relate these characteristics to features of the skeleton.

← Student explains in a limited way how a long neck was used by the dinosaur to live (i.e., a long neck helped the dinosaur to catch food).

Overall, the student shows some understanding of how observation of the structure and scale of an animal's skeleton can provide information about characteristics of the animal. The student accurately identifies one feature of a dinosaur skeleton shown in a diagram and explains, in a limited way, how that feature relates to the dinosaur's survival.



ANNOTATED STUDENT RESPONSE

Grade 7 Science

Sample 1-Point Response of Student Work

Student Response

I say it was a meat eater and it could fly
it lived in a nest.

I say it was a daradactoll.



Student does not identify any features of the skeleton, but does correctly identify two characteristics of the dinosaur that can be related to the skeleton (i.e., the animal was a meat eater and could fly).

Overall, the student shows a minimal understanding of how observation of the structure and scale of an animal's skeleton can provide information about characteristics of the animal. The student identifies two characteristics of the dinosaur, but fails to link them to features observed in the skeleton.



INSTRUCTIONAL STRATEGIES

Grade 7 Science

The open-response item **“Dinosaur Fossil”** was designed to address students’ (1) understanding of the concepts of biological adaptation and scientific models, and (2) ability to use a scientific model to explain the organization and functioning of a living thing and characteristics that might be observed. The instructional strategies below present ideas for helping students explore and master these concepts and skills.

Discuss the following concepts and skills with students:

- Organisms are classified into groups by various characteristics (e.g., body coverings, body structures).
- Each organism has structures that serve different functions in growth, survival, and reproduction.
- Living systems at all levels of organization demonstrate the complementary nature of structure and function.
- Important levels of organization for structure and function include cells, tissues, organs, organ systems, organisms (e.g., bacteria, protists, fungi, plants, animals), and ecosystems.
- Each type of cell, tissue, and organ has a distinct structure and set of functions that serve organisms.
- Fossils provide important evidence of how environmental conditions and life have changed.
- Biological adaptations include changes in structures, behaviors, or physiology that enhance survival and reproductive success in a particular environment.

Provide opportunities for students to work individually, in pairs, in small groups, and/or as a class to complete (with teacher guidance and support) any or all of the following activities:

- Use videodisc clips, microscope slides, photos, and illustrations to compare different types of cells, describing shapes, relative sizes, and observable structures.
- Create models of single cells or single-celled organisms. Explain the functions of cells and how their shapes help them perform their functions. Investigate how cells work together to perform different functions.
- Investigate the levels of organization in plants and animals.
- Compare visual representations of animal skulls including carnivores and herbivores. Record observations of characteristics such as head shape, eye position, and type of teeth.
- Examine collections of birds, concentrating on specific structures (e.g., beaks, feet, wings). Research the eating habits and lifestyles of each type of bird. Make posters or displays explaining the connection between a bird’s body structure and functions.
- Explore how fossils form (e.g., molds, casts, mineralization, imprints). Research different types of fossils found in Kentucky.



INSTRUCTIONAL STRATEGIES

Grade 7 Science

- Compare fossils (e.g., brachiopods, leaf imprints, coral) to non-fossilized, modern counterparts (e.g., clams, oysters, bones, shells, teeth). Dissect a clam or an oyster and identify different body structures that allow it to survive in its environment. Explain the functions of each body structure. Compare a brachiopod's body structures to that of the clam or oyster. Explain how the brachiopod's body structures were adapted to survive in its environment.
- Compare the ancient environment (i.e., oceans) of Kentucky's state fossil (i.e., brachiopod) to the current environment. Create comparative dioramas to show how Kentucky's environment has changed over time.